Grass Breeding to Improve Fiber Quality

PRO-DAIRY Program
Winter Forage Meetings
January 31st – February 2nd 2017

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Ruminants RULE!

We eat plants

so you don’t HAVE to!
I can turn grass into heavy whipping cream.

What’s YOUR super power?
Fake News Kills!
"...it's now clear that so-called fake news can have real-world consequences," Hillary Clinton

January 13, 1961 a

March 26, 1984 b

a http://content.time.com/time/covers/0,16641,19610113,00.html
b http://content.time.com/time/covers/0,16641,19840326,00.html

https://www.dietdoctor.com/member/presentations/eenfeldt-sd
Poaceae

Large and nearly ubiquitous family of monocotyledonous flowering plants.

Approximately 780 genera and around 12,000 species, the fifth-largest plant family.

The Poaceae are the most economically important plant family, providing feed for domestic livestock and wildlife from natural grassland, cultivated pasture and forage crops, staple foods from domesticated cereal crops such as corn, wheat, rice, barley, and millet, building materials (bamboo, thatch, straw) and fuel (ethanol).

Grasslands (savannah and prairie) approx. 40.5% of the land area of the Earth (excluding Greenland and Antarctica).

Grasses are also an important part of the vegetation in many other habitats (wetlands, forests and tundra).
Cool Season Forage Grasses

- 11 Main Groups
  - Tall Fescue
  - Orchard grass
  - Brome Grasses
  - Wheatgrasses
  - Phalaris
  - Ryegrasses
  - Timothy
  - Bluegrasses
  - Wildrye
  - Creeping and meadow Foxtails
  - Other (50 species)

Grandfather’s Grasses
Varietal differences

“Greater differences exist among grass varieties than among corn hybrids and soybean varieties”

Dr. Dan Undersander, Univ. WI
There’s nothing so expensive as cheap seed!

Breeding Improved Forage Grasses

Factors affecting selection for both cutting and grazing systems

- Persistency
- Stress tolerance to heat, drought, freeze
- Disease (Rust, Xanthomonas)
- Effluent water / Salt tolerance
- Forage quality
Breeding Improved Forage Grasses

Rust
Persistence
Salt tolerance

Carbohydrate Digestibility Affects Health & Production

Dairy rations contain carbohydrates (NFC and NDF)

Properly balancing NFC and NDF is critical for health and production in high producing dairy cows.

Variations in fiber digestibility affect production more than variations in starch digestibility

Starch digestibility => 3-5 lb/day
Fiber digestibility => 6-7 lb/day
Assessing fiber digestion not easy

A 2-3 unit change in fiber digestibility corresponds to 1 lb change in milk yield.

What is your forage made of?

<table>
<thead>
<tr>
<th></th>
<th>ALFALFA</th>
<th>GRASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>27%</td>
<td>16%</td>
</tr>
<tr>
<td>NDF</td>
<td>35%</td>
<td>43% to 70%</td>
</tr>
<tr>
<td>ASH</td>
<td>8%</td>
<td>8%</td>
</tr>
<tr>
<td>FAT</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>NFC</td>
<td>27%</td>
<td>18% to 30%</td>
</tr>
<tr>
<td>NFC</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>NDFd</td>
<td>25-45%</td>
<td>25-60%</td>
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</tbody>
</table>
Fiber Digestibility Varies in Grasses

NutriFiber grasses are higher in fiber digestibility than other grasses with similar NDF content*

<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>NDF Range</th>
<th>% of DM</th>
<th>TTNDFd % of NDF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Spirit®</td>
<td>13</td>
<td>46 to 56</td>
<td>59.5</td>
<td></td>
</tr>
<tr>
<td>Other Grass Forage</td>
<td>448</td>
<td>46 to 56</td>
<td>48.3</td>
<td></td>
</tr>
</tbody>
</table>

* Forage samples submitted to Rock River Labs, Watertown, WI in 2012

Troubleshooting with TTNDFD

Item 2009 2010
NDF 43% 37%
NDFD30 62% 61%

Switched from 2009 to 2010 Corn Silage WHAT HAPPENED?
# Relative Forage Quality of Grasses

All Grasses harvested at Boot Stage

<table>
<thead>
<tr>
<th>Grass Type</th>
<th>Variety</th>
<th>Heading Date</th>
<th>PROTEIN (%)</th>
<th>NDF (%)</th>
<th>NDFd (%)</th>
<th>IVTD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perennial Ryegrass</td>
<td>BAR 1M</td>
<td>16-May</td>
<td>16.9</td>
<td>55.5</td>
<td>83.5</td>
<td>90.9</td>
</tr>
<tr>
<td>Perennial Ryegrass</td>
<td>Remington</td>
<td>25-May</td>
<td>14.0</td>
<td>57.0</td>
<td>81.0</td>
<td>89.2</td>
</tr>
<tr>
<td>Meadow Fescue</td>
<td>Pradel</td>
<td>16-May</td>
<td>16.8</td>
<td>55.3</td>
<td>83.7</td>
<td>90.9</td>
</tr>
<tr>
<td>Meadow Fescue</td>
<td>Barvital</td>
<td>14-May</td>
<td>17.7</td>
<td>51.9</td>
<td>89.0</td>
<td>94.3</td>
</tr>
<tr>
<td>Tall Fescue</td>
<td>Retu</td>
<td>21-May</td>
<td>15.5</td>
<td>57.2</td>
<td>75.4</td>
<td>85.9</td>
</tr>
<tr>
<td>Tall Fescue</td>
<td>Barcel</td>
<td>18-May</td>
<td>16.8</td>
<td>54.7</td>
<td>79.3</td>
<td>88.7</td>
</tr>
<tr>
<td>Orchard grass</td>
<td>Potomac</td>
<td>14-May</td>
<td>16.7</td>
<td>64.2</td>
<td>75.4</td>
<td>84.2</td>
</tr>
<tr>
<td>Orchard grass</td>
<td>Baridana</td>
<td>14-May</td>
<td>17.6</td>
<td>62.6</td>
<td>79.7</td>
<td>87.3</td>
</tr>
</tbody>
</table>

Grass Trial in Ithaca, NY, Forage quality predictions by NIRS; NDF: neutral detergent fiber; NDFd: NDF digestibility (48 hour digestion)
Return to Your Roots

Barenbrug’s Breeders
Spaced Plants:
The Final Frontier...
Genetic Diversity
You can tell the difference

BarOptima PLUS E34  Traditional Rough Leaf Tall Fescues

You can tell the difference

Barenbrug Soft Leaf Fescues  Traditional Rough Leaf Tall Fescues
And so can they!

Kentucky 31 Paddock

BarOptima PLUS E34

TTNDFD and NDF of Tall Fescue
2015 MSU Study
Prize winning, 2015

Champion in Quality Counts Hay/Haylage
1st place in the Haylage and Baleage Divisions
2nd place in the Grass Hay Division
Prize winning, 2015

Green Spirit
1st, 2nd, 13th, and 18th in the Haylage Division
- 42% dry matter
- 15.5% crude protein
- 24.3% ADF
- 39.5% NDF.

RFQ 254, 4,040 lbs of milk predicted per ton.

Also won the Quality Counts award for the Hay/Haylage category, surpassing all other entries in the Baleage, Commercial Hay, Dairy Hay, Grass Hay and Haylage Divisions.

Prize winning, 2015

Barenbrug soft leaf fescues
1st and 2nd in the Baleage Division
- 56.6% Dry Matter
- 15% Crude Protein
- 22.2% ADF
- 37.4% NDF
- 245 RFQ

2nd in Grass Hay Division with BarOptima PLUS E34°
Prize winning, 2016

World’s Forage Grand Champion (over all categories including corn silage)
Tom Leubke, Mayer, MN
Green Spirit - Alfalfa Mix From Grass Hay Category

81.4% Dry Matter
19.6% Crude Protein
19.9% ADF
28.8% NDF
77.0% NDFd 30hr IV
216 RFQ, 4,086 lbs of milk predicted per ton

Barenbrug represented in 5 of the top 10 finalist in the grass hay division

Coming attractions
Thank you!

Questions?